The Unknown Hydrate LAB

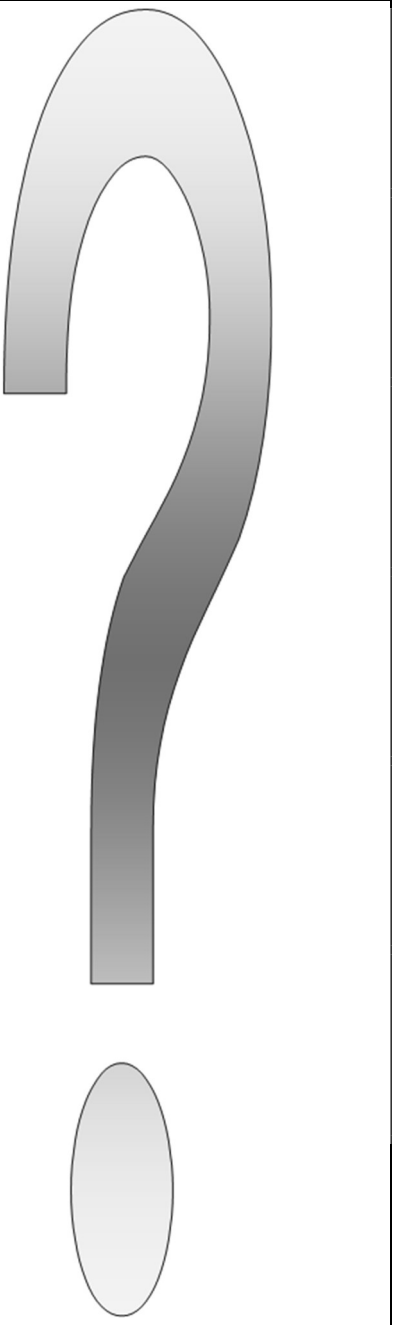
40/1200 minutes name -

A hydrated ionic compound is an ionic compound with a certain amount of hydrate (which means WATER) loosely bonded to it. By heating this hydrate over and over until it stops changing mass, and all the water evaporates into a gas, we end up with an anhydrous salt. From the masses in the data table, you can determine the percent composition of water by mass of this hydrated compound.

Today we have some white crystals of an UNKNOWN HYDRATE. Put 2.50 to 5.00 grams of this hydrate into an evaporating dish and heat it until it stops losing mass.

The unknown hydrate could be any one of the 7 listed on the table on page 2. There are several new things to discuss before the lab begins, on top of page three. Nothing hard, but this is important to review prior to doing any of your math.

A	mass of empty evaporating dish	grams
B	evaporating dish + hydrate	grams
C	amount of unknown hydrate used	grams
D	mass after first heating	grams
E	mass after 2nd heating	grams
F	mass of anhydrous salt E - A =	
G	Mass of missing water C - F =	grams



This page is only for ANSWERS. ALL your math must be done on white paper.

	Compound name	Compound Formula	Molar mass g/mole	% comp by mass of water (round to 3 SF)
1	zinc sulfate heptahydrate			
2	sodium sulfate dodecahydrate			
3	potassium fluoride dihydrate			
4	sodium borate decahydrate			
5	sodium acetate trihydrate			
6	aluminum potassium sulfate dodecohydrate			
7	Iron (III) chloride hexahydrate			

You will meet a few odd things in this lab.

Two compounds have DODECAHYDRATE names. That means (2 + 10 =) 12 H_2O per formula unit.

Next is a compound with 2 metal cations at the same time! Aluminum potassium sulfate dodecahydrate. It has 2 (!) cations combined to two sulfates. The Al^{+3} and the K^{+1} make a +4 cation combo, which requires two sulfate anions (SO_4^{-2}) to balance to zero charge.

Lastly, there is a borate anion, a polyatomic ion that's not in table E. The borate anion is $B_4O_7^{-2}$

Do ALL of you work on white paper.
· This lab requires a cover sheet with a single sentence explaining the point of the lab 1 point
· Ten questions below x 2 each = 20 points
· Conclusion: How does this lab experiment allow you to learn about percent composition by mass.
· Also tell your percent error and explain where it comes from.
· Explain what "heating to a constant mass" means 4 points

Questions for Lab - SHOW ALL WORK - PAPER IS CHEAP, KNOWLEDGE IS VALUABLE.

Round all the water % Comp to 3 SF! Put your final answers into the table on page 2.

1. Calculate the % comp by mass of water in the compound: zinc sulfate heptahydrate

2. Calculate the % comp by mass of water in the compound: sodium sulfate dodecahydrate

3. Calculate the % comp by mass of water in the compound: potassium fluoride dihydrate

4. Calculate the % comp by mass of water in the compound: sodium borate decahydrate

5. Calculate the % comp by mass of water in the compound: sodium acetate trihydrate

6. Calculate the % comp by mass of water in the compound: aluminum potassium sulfate dodecahydrate

7. Calculate the % comp by mass of water in the compound: iron (III) chloride hexahydrate

8. Using the percent comp by mass formula and your data, calculate the % comp by mass of water in your UNKNOWN SAMPLE.

9. Of the seven hydrates above, which compound did you use in this lab?

10. How do you know it was "that" one? Calculate your percent error (SF and a sign required!)